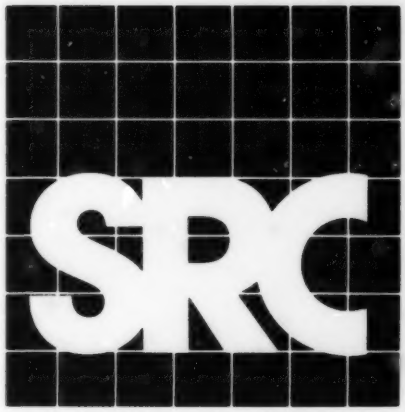

Saskatchewan Research Council

Annual Report 1989-90

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CORPORATE PROFILE

Established in 1947, SRC furthers the economic development and diversification of Saskatchewan by providing unique applied scientific, engineering, and technical services. Over two hundred scientists, engineers, technicians and support staff deliver these services to the resource, manufacturing, agriculture, and business sectors of Saskatchewan. The total operating budget in 1989-90 was approximately $15 million, 65 percent of which was generated through projects on a fee-for-services basis.

In 1989, SRC worked with over two thousand clients in government, industry and business to carry out it's mission: "Applying science and technology for Saskatchewan's development."

SRC is a member of the Association of Provincial Research Organizations (APRO).
APRO President 1989-91: Jim Hutch

Hon. Richard Swenson

LETTER OF TRANSMITTAL

February 1991

To the Honourable Sylvia Fedoruk
Lieutenant Governor of Saskatchewan

May it please your Honour:

The undersigned presents herewith, for your consideration, the report of the Saskatchewan Research Council for the year ended March 31, 1990.

Respectfully submitted,

Richard Swenson
Minister Responsible for the Saskatchewan Research Council

THE RESEARCH COUNCIL ACT

Section 21, in part, directs that:

The Council shall on or before the last day of February in each year submit to the Lieutenant Governor in Council a report of its proceedings and transactions during the next preceding calendar year which report shall contain such particulars as the Lieutenant Governor in Council may prescribe. Every report shall be laid before the Legislative Assembly if then in session, or if not in session, within fifteen days after the opening of the next session.

SASKATCHEWAN RESEARCH COUNCIL BOARD OF DIRECTORS

(as of March 31, 1990)

Gordon C. Birney
Chairman, SRC
Partner, Birney & Smith
Chartered Accountants
Saskatoon

John Cross
Vice-Chairman, SRC
President
Philom Bios Inc.
Saskatoon

Jim Hutch
Secretary, SRC
President, SRC
Saskatoon

Hon. Rick Swenson
Minister Responsible for SRC
Regina

Dr. Cam Blachford
Associate Vice-President &
Dean
Faculty of Graduate
Studies and Research
University of Regina
Regina

Marcel de la Gorgendiere
Chairman of Saskatchewan
Securities Commission
Saskatoon

Oscar Hanson
President
SaskEnergy Corporation
Regina

Curtis F. Kunkel
President
ALTO Construction
Services Ltd.
Esterhazy

Thomas Mann
Farmer
Drinkwater

J.G. (Jack) Manns
Associate Vice-President
(Research) & Dean, College of
Graduate Studies & Research
University of Saskatchewan
Saskatoon

Peter N. Nikiforuk
Dean, College of Engineering
University of Saskatchewan
Saskatoon

Harley D. Olsen
Executive Co-ordinator
World Centre for Agricultural
Science and Development
Saskatoon

Diana S. Rak
Marketing Manager
Peat Marwick Consulting Group
Saskatoon

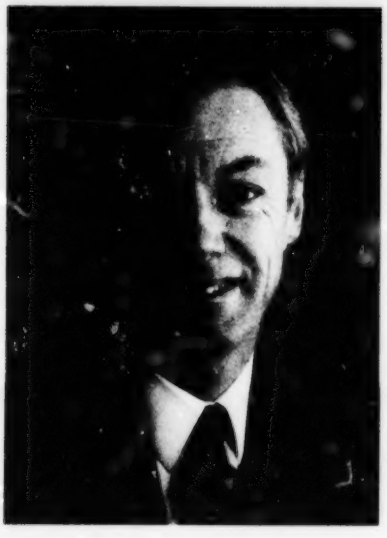
Gavin Semple
President & General Manager
Brandt Industries Ltd.
Regina

Sharon Stevenson
Saskatoon

Carol Teichrob
Moonvale Farms
Saskatoon

W.L. (Bill) Whelan
Manager, Saskatchewan
Division
Canadian Petroleum Association
Regina

CHAIRMAN'S REPORT



Gordon Birney,
Chairman of the Board of Directors

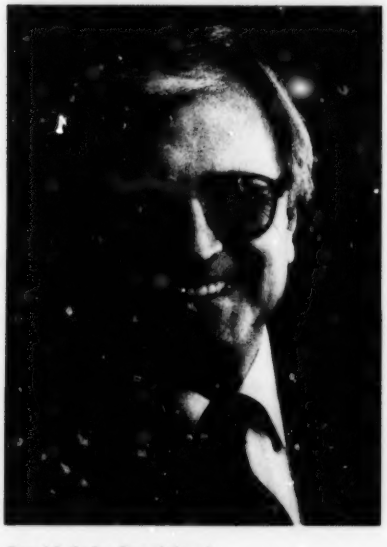
The Saskatchewan Research Council has enjoyed another successful year of operations in spite of a less-than-desirable economic climate. The Canadian economy was beset with such components as large government deficits, high interest rates, increasing costs of crude oil, a record number of bankruptcies, a general slowdown in business and consumer spending, and serious setbacks in GATT negotiations which have seriously affected the future wellbeing of agricultural activities in Canada, and particularly Saskatchewan.

Under such conditions, new opportunities and challenges were presented to SRC, and it responded very well.

With diligence and determination, the people of SRC reacted positively to these new developments. New directions were taken to increase contract revenue with the business sector, as revenues from government contracts declined. The results were very encouraging with significant increases in revenue from business sources. The total contract revenue for the year improved from that of the previous year under very difficult economic conditions.

While obtaining increased revenues, SRC maintained its national and international recognition as having a leading-edge role in several areas of research, including the following:

PRESIDENT'S MESSAGE



Jim Hutch, President

Staff:
B. Gilroy
J. Konecsni (M.A.)
L. Kunstmann

SRC's performance over the past seven years demonstrates that we have seen change as a challenge to be met with flexibility, imagination and optimism. This has resulted in modest growth for SRC despite a less than healthy economic climate. This change and growth was possible because of the responsiveness and adaptability of our staff and the strength of our networks.

Our success with industry was a direct result of the client service mentality that has been championed by our staff. The emphasis on our clients has helped shape our corporate culture which is professional, businesslike and market driven. Their needs have become our business. Keeping ahead of change is a matter of survival because in the present global market a successful product today can be obsolete tomorrow. In a time of scarce fiscal resources, we have learned that this means teamwork, both outside and inside the organization.

Much progress was made on the expansion of our networks and partnerships. Provincially we work with the economic development infrastructure to assist small businesses. This includes the Business Resource Centres, Rural Development Service Centres, and Chambers of Commerce. We have also collaborated with the universi-

- Pipeline Research Centre
- Bovine blood typing
- Heavy oil recovery and enhancement
- Groundwater research and development
- Air sampling equipment, and indoor air testing
- Farm equipment design and testing

And, SRC continues to play a significant role in rendering a multiplicity of services to the resource development industries - agriculture, oil, uranium, potash, gold, and diamonds.

New environmental concerns throughout the world were also an important element of the past year. The environment group of SRC is well recognized in Saskatchewan and Canada and continues to assist industry and government to respond to the events and challenges associated with the many environmental concerns of the provincial, Canadian and global community.

To pursue its efforts in the development of Saskatchewan business through the processing of new and existing Saskatchewan products, and the promotion and marketing of those products nationally and internationally, SRC continues to work closely with its manufacturing customers to stimulate and support the development and diversification of the Saskatchewan economy, and particularly the Saskatchewan rural economy.

Global networking and the establishment of international trade connections have become an integral part of Canadian business. To support the marketing of Saskatchewan products and expertise on an international scope, SRC has several contracts with Pacific Rim countries.

SRC continues to be dedicated to maintaining a high degree of excellence in the performance of its projects. I am proud of the achievements of SRC, and its continuing contributions to economic and scientific development within the province. That pride is also shared by all of the members of the Board of Directors.

I wish to express my appreciation for the support of the Board of Directors. And, on behalf of the Board and myself, I wish to acknowledge the excellent leadership of Jim Hutch as President, and the dedication to excellence of the people at SRC.

Gordon Birney

ties and SIAST in areas of industry related training and research. A good example of cooperation is the work we have done with leaders in business, education, and government to find ways to achieve economic growth that is environmentally sustainable.

Small businesses in Saskatchewan have continued to benefit from national programs and networks such as NRC's IRAP that we help deliver. Our involvement in national associations has also helped us access new technologies for our clients. Our work with the Canadian Research Management Association (CRMA), especially in hosting the annual conference, and the Association of Provincial Research Organizations (APRO) has resulted in valuable contacts and interactions that helped improve our service to the province. Our collaboration with other Provincial Research Organizations (PROs) through APRO has led to our participation in national and international research projects and activities with Federal agencies and departments such as Industry, Science & Technology Canada and the Department of External Affairs.

Teamwork within SRC has been built in a variety of ways. We concentrated our efforts, time and energy on the personal and professional needs of our staff. Internal interactions and processes were emphasized and encouraged, staff services were expanded and enhanced, and managerial support strengthened. For example, improved benefit programs, an Employee and Family Assistance Plan, Employment Equity, and Career Planning have been started to support our most valuable resource, our people.

Confident in our people, we have accomplished much in the last year and look to the future with optimism.

I encourage you to read this Annual Report to become aware of our efforts and their relevance to the development and diversification of Saskatchewan's economy.

Our thanks go to the Honourable Rick Swenson, Minister Responsible for SRC, Mr. Gordon Birney, Chairman of the Board, and to the members of our Board of Directors for their support, guidance and encouragement in our day to day operations and planning for the future.

We look forward to the '90s in our role of "applying science and technology for Saskatchewan's development".

Jim Hutch

Aquatic Biology staff collect brood stock in Saskatchewan's North as part of a baseline project.

ENVIRONMENT AND RESOURCES TECHNOLOGY BRANCH

Vice President: Earl St. Denis, Ph.D., P. Eng.
Staff: G. Hanson (B.A.), B. Sarich

The Environment and Resources Technology Branch focuses its activities and expertise in support of the development of provincial resources. Responding to current and future needs to develop these resources in an environmental sustainable manner, the Branch delivers applied R&D and specialized services to government agencies and to industries involved in the exploration, development and management of Saskatchewan's resources. The process demands a full understanding of the Saskatchewan environment and the meaning of sustainability. The Branch engages in the acquisition, development, adaptation and transfer of technology to bring the full economic and social benefits of technology to the people of Saskatchewan.

ENVIRONMENT TECHNOLOGY

Director: Michel Mellinger, Doc.Spec., M.A.Sc., P.Eng.

Environment Technology provides scientific and technical research services in support of the management of Saskatchewan's ecosystem. Scientists and researchers work with industry and government to further the understanding of, and provide solutions for complex environmental problems created through industrial development.

Multi-disciplinary teams work with clients to identify their needs for scientific research and technical environmental information. This information is needed to ensure industrial development occurs in a sustainable manner. The understanding of underlying scientific evidence connected with environmental impacts will assist in the development of solutions now - and allow for successful management of Saskatchewan's ecosytem in the future.

Water quality and supply, air quality, waste and land management and global change are major research areas that best serve private sector developers and the Province of Saskatchewan in achieving a sustainable economic future.

Research projects involving technology transfer, scientific research and technical problem solving, are conducted for the private sector and the province. Saskatchewan's resource development, including agriculture, is the primary focus.

Staff:
I. Knorr
T. Regnier
J. Whiting (M.Sc.)

WATER QUALITY AND SUPPLY

Aquatic Biology

Section Leader: Guy Melville, Ph.D.

- Performed bioassays to determine the toxicity of municipal and industrial effluents in surface waterways.
- Conducted aquatic biology surveys for baseline and monitoring purposes.

Staff:
J. Matamala
B. Paquin (B.Sc.)
D. Richert (R.R.Tech.)

- Performed foodchain analyses to determine possible radionuclide contamination.

Publications:

Results of the Second Stage of Bioassays Conducted on Two Uranium Mine Effluents. *Swanson, S.* E-2000-12-E-89

Calculation of Maximum Acidifying Potentials for the Projection of Sensitive Saskatchewan Lakes. *Swanson, S. Shewchuk, S.* E-2130-1-E-89

Results of the Study of Effects of the Rabbit Lake Minewater Spill, November 6-7, 1989. *Swanson, S.* E-2130-2-E-89

Aquatic Baseline Data Report and Preliminary Environmental Impact Assessment for the "In-lake" Pit, Cluff Lake. *Swanson, S.* E-2130-1-E-90

Water Quality

Section Leader: Hans Peterson, Ph.D.

- Investigated water quality problems for rural water supplies, including municipal reservoirs and farm water sources.
- Developed systems for improving localized surface water quality.

Publications:

Managing Dugouts for Improved Water Quality. *Peterson, H.* E-2000-15-D-89

Algae Control in Farm Ponds - Progress Report. *Peterson, H.* E-2120-1-E-89

Biological Control of Weeds and Algae in Regina Stormwater Retention Ponds - Monitoring Report 1990. *Peterson, H.* E-2120-1-E-90

Algae Control in Farm Ponds. *Peterson, H.* E-2120-2-E-90

Professor Nick Christofi (front) from the Water Pollution Research Unit of Napier Polytechnic in Edinburgh, Scotland and Hans Peterson collect water samples to evaluate the physical and biological factors that control algae blooms.

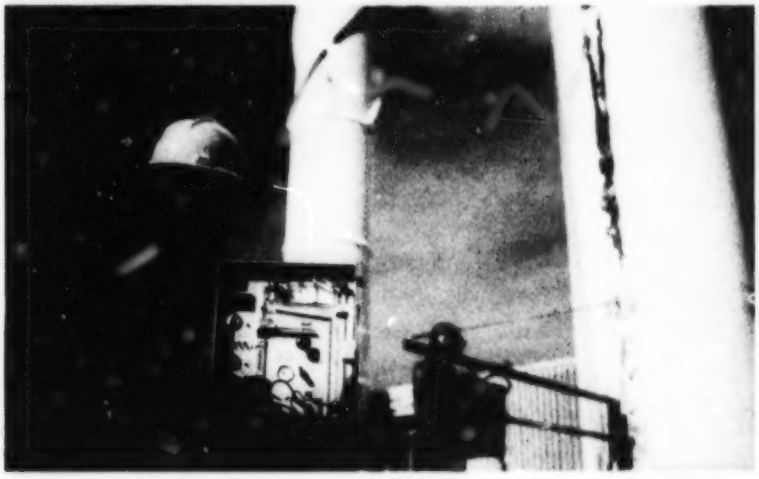
Staff:
I. Cantin (B.Sc.)
M.Moody (B.Sc.)
N. Ruecker (B.Sc.)

AIR QUALITY AND ATMOSPHERIC SCIENCES

Air Quality

Section Leader: Keith Wallace, B.Sc.

- Investigated stack emissions of Saskatchewan industries for atmospheric discharge.



SRC technologists Rolf Jahren (front) and Ray Begrand perform stack emission testing for companies to determine the emission rates of particulate material and various gases into the atmosphere.

Staff:
R. Jahren (B.Sc.)
R. Begrand (B.Sc.)

Stan Shewchuk measures the dye tracer with a fluorescence spectrophotometer as part of a spraydrift monitoring project.

Atmospheric Sciences

Section Leader: Stan Shewchuk, Ph.D.

- Investigated regional and local dispersion/deposition of airborne pollutants.
- Assessed effectiveness of sprayer technologies and methodologies in the agricultural and forestry industries.

Publications:

The Use of Shielded Nozzles to Reduce Off-target Herbicide Spray Drift. *Maybank, J. Shewchuk, S.R. Wallace, K.* E-906-16-A-89

Progress on the 1989 Operation and Maintenance of the Luck Lake Irrigation Meteorological Data Acquisition System. *Shewchuk, S.R. Smith, B.J.* E-2110-1-E-89

Herbicide Spray Drift Research, 1989: Field Tests of Four Sprayers. *Wallace,K. Shewchuk, S.R. Maybank, J. Wolf, T. Grover, R.* E-2310-1-E-89

Hooded Sprayers and Improved Drift Control. *Maybank, J. Shewchuk, S.R. Wallace, K.* E-2310-2-D-89

An Evaluation of the Rotorod Sampler in a Herbicide Drift Monitoring Program - A Progress Report. *Shewchuk, S.R. Wallace, K.* E-2310-3-E-89

An Evaluation of the Rotorod Sampler for a Herbicide Forestry Drift Monitoring Program. *Shewchuk, S. Wallace, K. Maybank, J.* E-2310-2-E-90

An Air Trajectory Analysis for an Air Pollution Episode on Mount Logan During 1950. *Shewchuk, S.* E-2310-3-E-90

Spray Drift and Swath Deposit Pattern from Forestry Herbicide Application. *Shewchuk, S. Wallace, K. Maybank, J.* E-2310-4-E-90

Climatology

Section Leader: Elaine Wheaton, M.Sc.

- Provided assessments of climatic factors that affect regional economies and ecological systems.
- Investigated the potential impacts of climate change and developed adaptive strategies.

Publications:

Some Climate Research Issues Relevant to the Canadian Prairies. *Wheaton, E.* E-2000-6-D-89

Agrometeorological Activity in Saskatchewan November 1988 to October 1989. *Wheaton, E.* E-2000-31-D-89

Global Climatic Change - Some Implications. *Wheaton, E.* E-2000-31-D-89

Global Warming - Implications of Climatic Uncertainty for the Canadian Prairies. *Wheaton, E.* E-2000-37-D-89

Prairie Dust Storms - A Neglected Hazard. *Wheaton, E.* E-2330-1-D-89

Forest Management Under Uncertainty: An Application to the Boreal Forest of Northwestern Alberta. *Brown, G. Van Kooten, G.C.* E-2330-2-E-89

Calibration of the SRC Climate Reference Station Automation. *Wheaton, E. Nicolichuk, N. Whiting, J. Smith, B. Shewchuk, S. Begrand, R. Wittrock, V.* E-2330-3-B-89

Staff:
V. Wittrock (B.Sc.)

Some Environmental and Economic Impacts of the 1988 Drought - Saskatchewan and Manitoba. *Wheaton, E. Arthur, L.M.* E-2330-4-E-89

Global Warming - A Canadian Perspective: Brief to the Standing Committee on Environment, House of Commons. *Wheaton, E.* E-2000-1-D-90

Global Warming and Changing Weather Patterns. *Wheaton, E.* E-2000-7-D-90

Climatic Change and the Opportunities It May Bring. *Wheaton, E.* E-2000-9-D-90

Using Climatic Change Scenarios to Estimate Ecoclimatic Impacts. *Wheaton, E.* E-2330-1-A-90

Saskatoon SRC Climatological Reference Station - Annual Summary 1989. *Wittrock, V. Wheaton, E.* E-2330-2-B-90

The Campbell-Stokes Bright Sunshine Recorder measures the amount of bright sunshine we receive. In 1989, Saskatoon received a total of 2,380.7 hours of bright sunshine, which is 97 percent of normal.

LAND AND WASTE MANAGEMENT

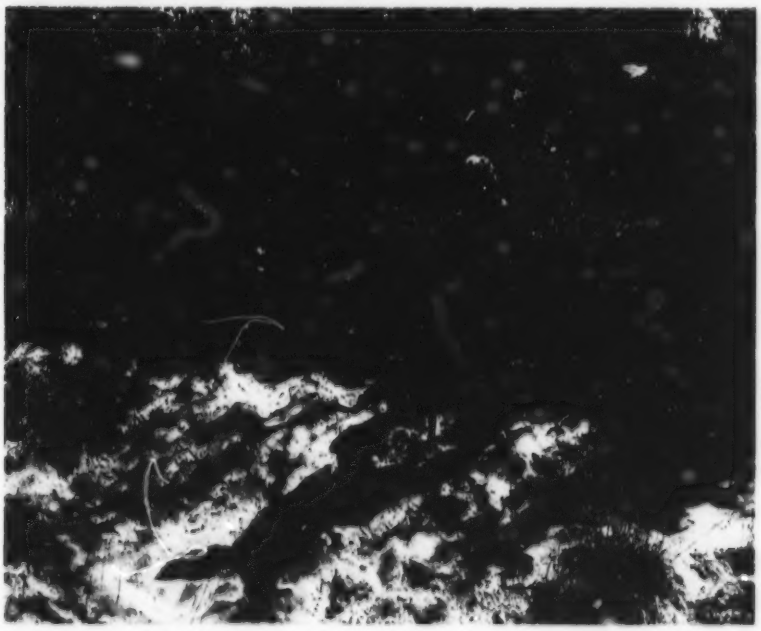
Applied Plant Ecology

Section Leader: Jeff Thorpe, Ph.D.

- Investigated safer and more productive disposal of wastes on land.
- Investigated revegetation of marginal agricultural land and disturbed areas.
- Provided technology transfer services to improve the management of provincial rangeland resources.
- Investigated forest ecology to allow for effective site classification.

Publications:

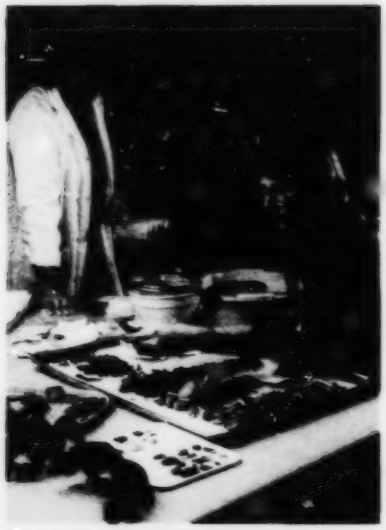
Land Farming of Oil and Gas Drilling Wastes - Phase III, Field Experiments - A Progress Report. *Abouguendia, Z.* E-2510-1-E-89



Research technologist Rick Lauzon examines the soil profile under pine forest to assess the environmental safety for herbicide application.

Staff:

B. Godwin (B.S.A.)
R. Lauzon (B.Sc.)



Research technologists Carol Beaulieu (left) and Peggy McKeand clean and classify artifacts recovered from an archaeological site

Development of an Assessment Procedure for Saskatchewan Rangeland - A Progress Report. *Abouguendia, Z. Thorpe, J. Godwin, R.* E-2520-1-E-89

A Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland - Range Improvement Practices. *Abouguendia, Z. Thorpe, J. Romo, J.* E-2520-2-E-89

A Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland - Grazing Systems. *Abouguendia, Z.* E-2520-3-E-89

A Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland - Range Plants. *Abouguendia, Z. Godwin, R.* E-2520-4-E-89

Development of an Assessment Procedure for Saskatchewan Rangeland - Second Progress Report. *Abouguendia, Z. Thorpe, J. Godwin, R.* E-2520-5-E-89

A Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland - Range Plan Development. *Abouguendia, Z.* E-2520-1-E-90

An Assessment Procedure for Saskatchewan Rangeland. *Abouguendia, Z. Thorpe, J. Godwin, R.* E-2520-2-E-90

Forage Production in Selected Aspen Locations in Saskatchewan - A Report on the 1989 Yield Season. *Thorpe, J. Godwin, R. Lauzon, R.* E-2520-3-E-90

Development of an Assessment Procedure for Saskatchewan Rangeland. *Abouguendia, Z. Thorpe, J. Godwin, R.* E-2520-4-E-90

Archaeology

Section Leader: Jim Finnigan, M.A.

- Investigated and documented archaeological sites in the Rafferty/Alameda Dam sites.
- Designed and presented public and educational programs concerning Saskatchewan's heritage.
- Compiled a regional heritage resources inventory for the tourist industry.

Publications:

The Historical Background of the Upper Souris River: 1734-1881. *Russell, D.* E-903-3-E-89

A Historic Resources Impact Assessment of an Access Road (Project 62185) on Muskowpetung Indian Reserve #80. *Gibson, T.H.* E-2200-1-E-89

Souris Basin Heritage Study: 1988 Heritage Investigations at the Rafferty and Alameda Reservoirs. *Finnigan, J.* E-2210-1-E-89

Excavation at DhMu-8 and 12: The Crooked Sky and Twilight Sites. *Finnigan, J.* E-2210-2-E-89

A Historic Resources Impact Assessment of the Fort Carlton Reception Centre Septic Facility. *Gibson, T.H.* E-2210-1-E-90

Staff:
C. Beaulieu (B.A.)
B. Ferris (B.A.)
T. Gibson (M.A.)
O. Klimko (B.A., B.Ed.)
P. McKeand (B.A.)
M. Rollans (M.A.)
D. Russell (M.A.)

INTEGRATED ENVIRONMENTAL SERVICES

Environmental Engineering

Section Leader: Mike Sulatisky, M.Sc., P.Eng.

- Provided research and technology transfer services concerning the use of alternative energy including compressed natural gas, wind power and demand side management.

Staff:
S. Hill (CAD/CAM Tech.)

Instrumentation
Section Leader: B. Smith

- Provided instrumentation services for field trials for land and air monitoring projects.
- Developed specialized instrumentation for environmental land, water and air monitoring.

Spatial Information
Section Leader: John Dyck, Ph.D.

- Provided technology transfer services concerning geographic information systems, remote sensing and image analysis.
- Developed advanced methods of analyzing earth images taken from space to better interpret the location and scope of Saskatchewan's resources. Primary clients were resource development companies in mining, agriculture and forestry.

Publications:

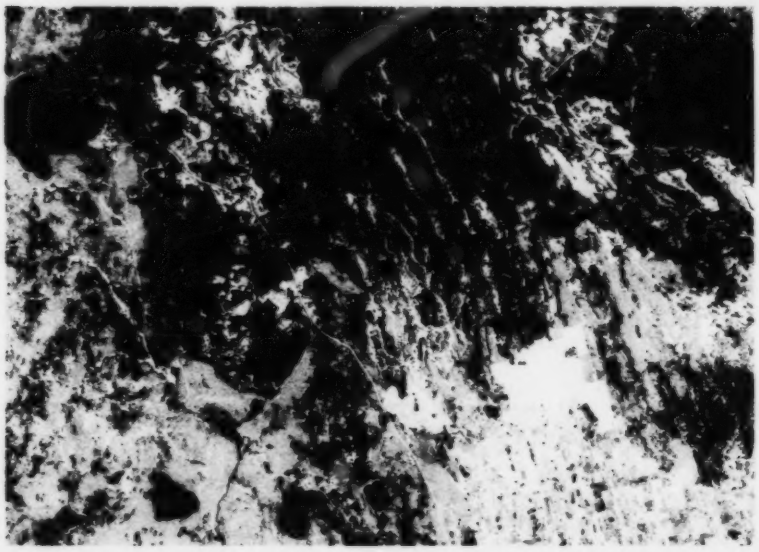
Herbicide, Nutrient and Water Drainage from an Irrigated Field - Final Report. *Nicholaichuk, W. Grover, R. Whiting, J.* E-905-10-E-89

Inventory of Geophysical Surveys: La Ronge Gold Belt Region, Saskatchewan, Parts I, II, III. *Dyck, J.H. King, B.* E-2000-8-E-89

The Use of LANDSAT and SPOT Satellites for Urban and Rural Mapping. *Whiting, J. Turnbull, J.* E-2000-22-A-89

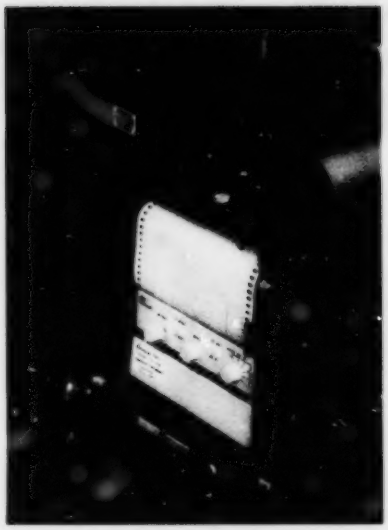
Remote Sensing, Geographic Information Systems, and Expert Systems: An Agricultural Application. *Bedard, D.* E-2000-34-A-89

Comparison of Satellite Forest Cover Maps to Traditional Forest Inventory Maps. *Polson, J.E. Ens, D.K. Whiting, J.W.* E-2400-1-D-89



A Landsat Thematic Mapper (TM) satellite image of the Waskesui and Candle Lake areas in Saskatchewan. This type of map is used for successional studies in burned and logged forest areas to determine re-growth patterns. Light green areas indicate aspen and birch trees; dark green are spruce and jack pine; black areas are water bodies. The forest fringe is clearly visible at the lower right hand corner.

Staff:
D. Bedard (B.E.S.)
A. Michelet
N. Nicolichuk (Civ.Eng.Tech.)
J. Polson (B.Sc.)
J.W.J. Smith (B.Sc.)



SRC technologist Brett Smith designed and assembled this dewpoint calibrator to calibrate lithium chloride dewpoint sensors. The equipment is used as part of a study to measure evapo-transpiration of water from fields.

Staff:
R. MacPherson (Commercial Pilot)

Research technologists Cindy Jackson and John Lundgren collect data from the pitch coking evaluation unit. This project evaluates improvements to the delayed coker operations at the Co-op Upgrader.

Land Cover Classification of Satellite Imagery for Saskatoon and Edenwold - Interim Report. *Whiting, J. Nicolichuk, N.* E-2430-1-E-89

Using Satellite Information as a Tool for Range Management - Final Report No. 4. *Whiting, J. McCartney, D. Polson, J. Nicolichuk, N.* E-2430-2-E-89

Regeneration Survey Using Satellite Data. *Polson, J.E. Thorpe, J. Richmond, T. Whiting, J.* E-2430-3-E-89

Monitoring the Northern Hemisphere for Weekly Crop Growth. *Whiting, J. Pokrant, H.* E-2000-2-D-90

Monitoring the Global Change of Water Resources Using Remote Sensing. *Whiting, J. Bukata, R.* E-2000-6-A-90

Remote Sensing and GIS for Crop Monitoring. *Whiting, J.* E-2000-12-A-90

An Examination of the Role of Satellites in Monitoring the Impacts of Climate Change on the Hydrological Cycle. *Whiting, J. Bukata, R.* E-2410-1-A-90

RESOURCES TECHNOLOGY

Director: Jim Hutchinson, M.S., B.A.Sc.

Petroleum Research

Manager: R. (Ranga) Ranganathan, Ph.D.

Petroleum Research addresses the problems and opportunities relating to the utilization of Saskatchewan's petroleum resources. The research projects focus on enhanced oil recovery processes, such as in-situ combustion, steam and carbon dioxide technologies such as horizontal wells, emulsions production and treatment problems, as well as upgrading characteristics.

Researchers carry out multiclient projects, as well as working on projects for individual companies. In addition, the researchers carry out a number of joint industry/government projects under contract.

The Analytical Laboratory associated with Petroleum Research serves oil companies and laboratory research projects through specialized petroleum analytical services. The technical library provides support to laboratory staff and outside industry personnel with up-to-date

A Thermal Balance is used for analysis of core, oil and oil constituents.

technical and scientific information. Special emphasis is placed on the preparation of quality reports and technology information for effective technology transfer on an ongoing basis. Associated laboratories house pressure/volume/temperature (PVT) equipment, coreflood units, physical models, high-pressure reactor systems, and a field emulsion treatment trailer.

- Initiated a horizontal well enhanced recovery project jointly with the Alberta Research Council. Ten companies are participating in the project.
- Used the horizontal well physical model system for contract work in the Sceptre-Murphy Tangleflags pilot project.
- Presented industry with seven multiclient project reports relating to horizontal wells, heavy oil/CO_2, in-situ combustion, emulsions, thermal studies and upgrading.
- Installed and conducted numerical simulation models in cooperation with the Computer Modelling Group.
- Operated a field-scale coalescer column at Murphy Oil Company's in-situ combustion pilot plant near Eyehill, Saskatchewan. Modifications are being made based on field test results.
- Completed the development of the HPLC (high performance liquid chromatography) technique for measuring SARA (saturates, aromatics and resins).
- Advanced the licensing of the "Fuels From Vegetable Oil Technology", which was developed by SRC and is patented by the federal agency that acquired ownership of the technology.
- Initiated a joint upgrading research project with the Idemitsu-Kosan Co. of Japan. This project included personnel exchanges of SRC and Japanese scientists.
- Presented papers at the United Nation Institute for Training and Research (UNITAR) and Canadian Institute for Mining and Metallurgy (CIM) conferences.
- Conducted bench-scale process tests to produce value-added products from sodium sulphate.
- Conducted a feasibility study for the production of chemicals from brine under a multiclient contract to Saskatchewan Energy and Mines, Saskatchewan Power Corporation (SPC), Transalta, Shell and Alberta Power.

Publications:

Development of Analytical Methods for Monitoring Thermal EOR Producing Wells. *Verkoczy, B. Jimale, M.* P-110-146-E-89

Evaluation of Catalyst Deactivation Caused by Catalyst Adsorption. *Soveran, D. Jackson, C.O. Sekhar, M.V.C.* P-110-129-D-89

The Potential of the Immiscible Carbon Dioxide Flooding Process. *Dyer, S. Farouq Ali, S.M.* P-110-131-D-89

Separation and Characterization of Surfactants Present in Emulsions Produced in Thermal Recovery Processes. *Mourits, F.M. Coulombe, S.* P-110-132-D-89

Senior research engineer Jerry Scoular is taking readings in the mobile field demulsification trailer.

Staff:

E. Chung (B.Sc.)
S. Dyer (M.Sc.)
R. Exelby (Mech.Eng.Tech.)
N. Freitag (Ph.D.)
N. Gaveronski
E. Horn
S. Huang (Ph.D.)
K. Hutchence (M.Sc.)
C. Jackson (B.Sc.)
I. Kitamura
B. Kristoff (B.E.)
L. Kurucz (Chem.Tech.)
J. Lundgren
E. Ogu (M.Sc.)
E. Pappas (B.Sc.)
G. Perron
B. Schnell
S. Schoon
J. Scoular (B.E.)
D. Sinclair
D. Soveran (B.E.)
K. Sterrenberg
B. Verkoczy (Ph.D.)

The inside of a Scaled Horizontal Well physical model. Horizontal wells are increasingly used for heavy oil recovery.

A Preliminary Study on the Evaluation of Opportunities for Utilization of Naturally Occurring Brines for the Production of Chemicals. *Ogu, E. Arnold, A.* P-110-124-E-89

A Laboratory Miscible Displacement Study for the Recovery of Saskatchewan Crude Oil. *Huang, S. deWit, P. Jha, K.* P-110-128-D-89

Processing Studies of Bitumens/Heavy Oils Produced by Recovery Methods of a Diverse Nature. *Soveran, D.W. Ogu, E.N.* P-110-120-E-89

Pipeline Technology

Manager: Randy Gillies, M.Sc., P.Eng.

SRC's Pipeline Technology Centre operates a world-class pipeline flow testing facility to develop improved transportation methods for Saskatchewan's mineral and petroleum resources.

- Physical modelling of the flow conditions in horizontal wells for crude oil production.
- Pipeline testing of the flow behaviour of various mixtures including coal in petroleum crudes and condensates, upgraded lignite in water slurries, heavy crude oil in water emulsions and tar sand tailings slurries.
- Physical and mathematical modelling of the flow conditions in hydraulic hoist systems.
- Delivered presentation at Canadian Heavy Oil Association Technical Session (Calgary, Alberta), entitled "Emulsions for Short Distance Transportation of Heavy Crude Oil: Pipeloop Test Results".

Publications:

"An Improved Two Layer Model for Horizontal Slurry Pipeline Flow", accepted for publication in Canadian Journal of Chemical Engineering. *Gillies, R.G., Shook, C.A. and Wilson, K.C.*

Inside SRC's Pipeline Technology Centre, research technologists Joe Lychak (back) and Mike Small conduct a flow test on the 500 mm/diameter pipeline loop to determine transport characteristics of a coal slurry.

Staff:
J. Lychak
P. Schergevitch
M.Small (Chem. Tech.)

Minerals/Groundwater

Manager: Bryan T. Schreiner, Ph.D., P.Eng.

Scientists, engineers and technicians in Minerals/Groundwater focus their expertise on Saskatchewan's groundwater, metallic and industrial mineral resources. Quantitative and qualitative assessments are provided through mapping, monitoring, modelling, and analyzing these resources.

A large proportion of Saskatchewan's rural population depends on groundwater as its principal source of water supply. Working to ensure safe and reliable water supplies, scientists conduct ongoing investigations including recharge rates, migration of salts from potash tailings, geochemical evaluation of groundwater and the effects of irrigation development. Drought conditions in the province over the past several years intensified the need for accurate and comprehensive information concerning groundwater supplies, particularly for larger communities. Groundwater mapping, observation wells, and resource evaluations provide valuable information concerning the effective and efficient management of such groundwater resources.

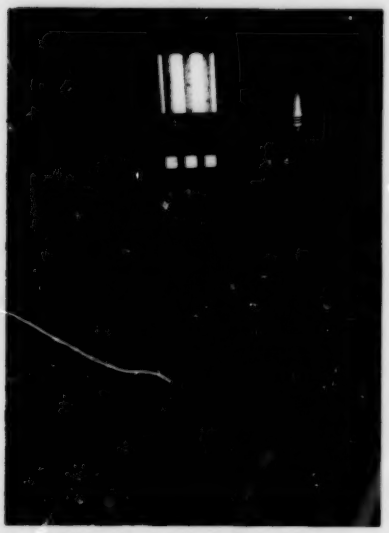
Minerals/Groundwater encompasses geological investigations of metallic mineral deposits and provides associated services through a Geochemical Laboratory, a Mineralogical Laboratory and the Mineral Processing Pilot Plant. These services include applied research, as well as technical and analytical expertise for Saskatchewan's mining industry.

- New techniques have been developed for uranium exploration, allowing investigation of deposits as far as one thousand feet below the ground.
- Developed a computer-aided mapping system to digitize and generate bedrock contour maps of the Plains Region. A series of 1:250,000 maps covering Saskatchewan has been completed. Work on the provincial surface geology map, bedrock surface topography, and drift thickness map continued.
- Provided Quaternary geology services (glacial drift mapping and analysis) to industries pursuing opportunities in the diamond play area.
- Developed new information systems for geological and groundwater data.
- Commenced a multi-year project on vertical migration of saline fluids for the Saskatchewan Potash Producers Association.
- Completed drift prospecting contracts relating to investigations into gold and platinum resources within the province.
- Commenced a multi-client project concerning groundwater flow and contaminant transport research in the Condie Aquifer, Regina area.
- Conducted a groundwater resource study for the Yorkton area to evaluate the quantity and quality of the groundwater resources in this region.

In the water resources field, research scientist Mac Millard interprets aquifer information to produce geology and groundwater maps.

Staff:

I. Annesley (Ph.D.)
P. Archibald (B.A.)
T. Armstrong
R. Banman
B. Bell
C. Bernath
D. Brumwell
J. Campbell (M.Sc.)
S. Cutts
D. Drapak
B. Gartner
A. Holsten (B.Sc.)
A. Jackson
E. Jaworski (R.R. Tech)
H. Maathuis (M.Sc.)
C. Madore
N. Marshall
C. McClelland
M. McEachern
G. Mengering
M. Millard (M.Sc.)
G. Morrison
P. Pridham
D. Quirt (M.A.Sc.)
S. Ryma
D. Saworski
J. Schultz
M. Simpson (B.A.)
G. Sinclair
C. Speidel
J. Stoutenburg (B.Sc.)
M. Turner
L. Turple (B.Sc.)
T. Warkentin (Chem. Tech.)
D. Zlipko (Water Sci. Tech., C.E.T.)



An Inductively Coupled Plasma (ICP) is used to measure the emission spectrum of a geological sample. As the sample passes through the plasma at close to 5000 °C, elements contained in the sample emit light at a characteristic wavelength which is measured to determine the quantity of that element within the sample.

- Carried out a preliminary evaluation of the groundwater resources of the Estevan Valley and Tableland aquifers in south eastern Saskatchewan.
- Completed the first year of a study on the complex geology of Archean and Aphebian rocks underlying uranium deposits in the Athabasca Basin.
- Clarified the geological processes for the formation of the Raven/ Horseshoe uranium deposit and defined exploration criteria for deposits in similar geological settings.

Geochemical Laboratory

The Geochemical Laboratory analyzed over forty thousand samples for the mining industry. The laboratory also provided expanded services in the following areas: fire assay analysis for precious metals, heavy mineral separation, and platinum-palladium analytical techniques. Analytical capabilities were expanded in response to increased exploration activities in the province, and expertise was developed to serve companies now exploring for diamonds.

- Expanded and upgraded analytical capabilities in response to increased activity in gold exploration.
- Extended services and geological expertise to include the diamond exploration industry. Analyzed approximately 4,000 till samples for heavy minerals and gold grains; 15,000 samples for gold fire assay; and 30,000 other samples, averaging about fifteen determinations per sample.

Mineralogical Laboratory

Using specific gravity determination and state-of-the-art X-ray equipment, the Mineralogical Laboratory analyzed and processed samples for mineral identification and rock characterization.

- Analyzed approximately 2,500 samples for clay minerals and 250 samples for specific gravity determinations.

Mineral Processing Pilot Plant

- Conducted bench scale and small pilot plant studies for uranium and gold projects as a subcontractor to mineral processing consultants. Assisted with the establishment of Cameco's new research and development group to strengthen the industry's research capability in Saskatchewan.

Publications:

A Re-interpretation of Lake Sediment Geochemistry in the NEA/IAEA Athabasca Test Area. *Mellinger, M.* E-2000-27-D-89

Concepts for Hazardous Waste Disposal in Southern Saskatchewan by Burial in Glacial Till. *Cherry, J. van der Kamp, G. Keller, C.* R-844-6-D-89

Theory of Earth Tide and Barometric Effects in Horizontal Aquifer-Aquitard Systems. *van der Kamp, G.* R-844-7-E-89

Annual Fluctuations of Groundwater Levels Due to Loading by Surface Moisture *van der Kamp, G. Maathuis, H.* R-844-8-A-89

Monitoring and Control of Subsurface Migration of Saline Fluids in the Vicinity of a Potash Waste Disposal Site Near Vanscoy, Saskatchewan. *Maathuis, H.* R-844-9-D-89

Computer Tools for the Integrative Interpretation of Geoscience Spatial Data in Mineral Exploration. *Mellinger, M.* R-851-2-A-89

The Wollaston Group and Its Underlying Archean Basement: An Update. *Annesley, I.* R-855-5-E-89

Whole-rock Geochemistry from Samples of Aphebian Wollaston Group Metasediments and Underlying Archean Granitoid Gneisses. *Annesley, I.* R-855-6-E-89

Geoscience Services and Fee Schedule. *Schreiner, B.* R-1200-3-G-89

Near Surface Mineral Potential of the Plains of Western Canada. *Millard, M. Simpson, M. Campbell, J.C. Schreiner, B.* R-1210-10-D-89

Evaluation of a Proposal for a Groundwater Dewatering Project Below Cookson Reservoir. *van der Kamp, G. Maathuis, H.* R-1220-1-E-89

Preliminary Evaluation of the Estevan Valley and Tableland Aquifers. *Maathuis, H. van der Kamp,* G. R-1220-2-E-89

Groundwater Quality on the Prairies: Can it Change with Time? *van der Kamp, G.* R-1220-4-D-89

Geochemical Norm Calculation Procedure for Clay Minerals. *Quirt, D.* R-1230-2-E-89

Norm Calculation Procedure for Potash Deposit Minerals. *Quirt, D.* R-1230-3-E-89

Metallogenetic Models as Exploration Tools. *Quirt, D. Annesley, I.* R-1230-4-A-89

Geochemical and Clay Mineralogical Data for Samples Taken from Drill Holes CAR-114, AS-1, AS-2. *Quirt, D.* R-1230-6-E-89

1989 Field Notes: (A) Raven/Horseshoe Sampling Program (SEM) (B) Eagle Point Fill-in Sampling Program (Cameco). *Quirt, D.* R-1230-7-E-89

Mineral Deposit Studies: Raven and Horseshoe Uranium Deposits - Preliminary Report. *Quirt, D.* R-1230-9-E-89

Mineralogy and Lithogeochemistry of Samples from the Martin and Thluicho Groups, Beaverlodge Area, Saskatchewan. *Quirt, D.* R-1230-1-E-90

The Frontier Granite and the Frontier Au Prospect, Goldfields Area, Northern Saskatchewan. *Quirt, D.* R-1230-2-A-90

Mineral Deposit Studies, Raven and Horseshoe Uranium Deposits, Project 3.12. *Quirt, D.* R-1230-3-E-90

Determination of Density and Specific Gravity on Geological Materials. *Quirt, D. Brule, R.* R-1230-4-E-90

1989 Field Notes - Drill Core. *Annesley, I.* R-1240-1-E-89

Research technologists in the Mineralogical Lab separate heavy mineral fractions from till samples. While indicator minerals are separated out in diamond exploration, in gold exploration, gold grains are separated out of the till sample.

Research technologist Mark Gimby plans a farm field day for farmers in the Humboldt area who want to learn more about organic farming practices.

1989 Field Notes - Outcrops. *Annesley, I.* R-1240-2-E-89

The Wollaston Group and Its Underlying Archaen Basement in Saskatchewan: 1989 Field Work and Preliminary Observations. *Annesley, I. Madore, C.* R-1240-3-E-89

Ceramic Whitewares Ecuador - Technical Report for the First Year of the Project May 1, 1988 - April 30, 1989. *Hudson, J.* R-1410-1-E-89

Ceramic Whiteware - Ecuador Interim Report November 16-30, 1989. *Hudson, J.* R-1410-3-E-89

Availability and Markets of Structural Industrial Minerals in Saskatchewan. *Simpson, M.* R-1210-1-B-90

Biomass Resources

Manager: Ewen Coxworth, Ph.D., M.A.

Research focuses on the development and transfer of sustainable agriculture technology and on the development of processing technology for agricultural products that are suitable for regional processing centres.

As well as completing work on methods to use chaff as a cattle feed on farms, new studies examined methods to transport and use chaff in small feedlots, and to process chaff to ethanol and other products in regional processing centres.

A second project was initiated on the development of kochia as a very saline tolerant and drought resistant annual forage crop for the southern prairies. Research feeding trials confirmed farmers' experience that kochia can be fed successfully at 50% or less of the diet, but should be restricted in winter maintenance rations for pregnant beef cows.

Work continued on using enzymes to improve the oilseed extraction of canola and improve the feed value of the meal. Improvements in oil quality and indigestibility of the meal were found.

- Coordinated studies by several Canadian research groups who found methods to produce ethanol from chaff at a cost and yield comparable to those shown in previous studies for ethanol from aspen wood. This increases the potential for producing ethanol from lignocellulosic materials like chaff, cost competitively with other liquid fuels within five to ten years.
- Determined, in cooperation with the Prairie Agricultural Machinery Institute, that compactor technology used in garbage trucks could be used to compress chaff to load densities of 10-11 lbs per cubic foot, which is close to the load limit for country roads. This could open up the feasibility of hauling chaff to regional processing centres.
- Found enzymes that may significantly increase the rooting development of crop seedlings. This could aid in the establishment and early growth of crops.
- Confirmed in farm trials that sweetclover in the rotation substan-

Staff:
M.Gimby (Dip.Agr.)
J. Kernan (M.A.)
A. Mair (Bio.Sci.Tech.)
A. Rutherford (M.Sc.)
K. Sosulski (Ph.D.)
E. Swerhone (Bio.Sci.Tech.)

tially increased the yield of following cereal crops. Even when sweetclover was underplanted to a cereal crop, it improved the feed value of the cereal crop chaff into the range of a medium quality hay.

- Completed farm demonstrations on the use of chaff in beef cow maintenance rations and commenced a feeding trial on the use of chaff as the roughage component of a feedlot growing ration. Satisfactory growth rates were obtained, confirming chaff's value as a low cost feed.
- Initiated an extensive study on the feasibility of organic cropping practices in Saskatchewan. Preliminary results from 1989 showed good crop yields (about 80% of conventional farms) and good weed control on the best organic farms. With low input costs and premium prices, some of the organic farmers had competitive net incomes for some crops.
- Weed control with killed young canola or mustard cover crops was confirmed in repeated field trials and growth room studies. The timing of planting the cover crop and the ability of the cover crop to become established before the weeds, were important factors, affecting to what degree weed control (kochia, green foxtail, wild oats) could be achieved. Shading by the cover crop was a significant factor in weed control.
- Ammoniation of terminal elevator screenings was found to destroy the viability of weed seeds in the screenings and increase the feed value.
- A number of crop production methods were identified that can increase farm net income and could tie in with the development of regional rural processing centres.

Research found that chaff can be used as an economical feed source for beef cattle.

Publications:

Benefits of Forage Legumes Inclusion in Crop Production and Processing Systems. *Coxworth, E.* R-1520-3-D-89

Chaff Utilization and Processing - An Example of Value Added Processing in Rural Saskatchewan. *Coxworth, E.* R-1530-2-E-89

Effect of Ammoniation Conditions on the Nutritive Value In Vitro of Cereal Chaff Determined Using Near Infrared Reflectance Spectroscopy and Evaluation of Residues from New Cereal Cultivars for Nutritive Value and Response to Ammoniation. *Kernan, J. Mair, A. Racz, V. Knipfel, J. Crowle, W.* R-1550-1-E-89

Drought Proofing Cattle Feed Supplies with Kochia. *Coxworth, E. Green, E. Knipfel, J. Steppuhn, H. Kernan, J.* R-1550-2-E-89

Lignocellulose-Degrading Enzymes from Solid-State Fermentation of Straw with Pleurotus Fungi and Their Industrial Applications. *Sosulski, K.* R-1560-1-E-89

Hydrolysis of Chaff with Hemicellulases Recovered from Pleurotus Fungi Spent Substrate. *Sosulski, K.* R-1560-3-E-89

Press Cakes from Enzyme-treated Canola as a Source of Protein for Broilers. *Sosulski, K.* R-1560-4-E-89

Lignocellulose-degrading Enzymes from Solid State Fermentation of Straw with Pleurotus Fungi and Their Industrial Applications. *Sosulski, K.* R-1560-5-E-89

Research associate Laurie Friesen examines plant cultures in the growth room. Micropropagation is a technology capable of producing large numbers of identical, potentially disease free plants.

Oil Quality and Chemical Characteristics of Presscakes from Enzyme-treated Canola. *Sosulski, K.* R-1560-7-E-89

Integrated Cropping Systems Chaff Utilization. *Rutherford, A. Coxworth, E.* R-1500-1-E-90

Natural Herbicides and Plant Growth Regulants in Canola and Sweetclover Residues. *Coxworth, E. Foster, K. Austenson, H. Mason, W. Mair, A.* R-1510-1-E-90

An Agronomic and Economic Comparison of Conventional, Low Input and Organic Wheat-wheat-fallow Rotations. *Rutherford, A. Gimby, M. Coxworth, E.* R-1530-1-E-90

Development of Specification Sheets to Aid Marketing of Oat Products CanMar Grain Inc., Regina, Saskatchewan. *Sosulski, K.* R-1560-1-E-90

Examination of the Technical and Economic Feasibility of Producing Liquid Fuel Extenders and Additives from Cereal Chaff. *Craig,W. Kernan, J.A.* R-811-1-E-89

The Effect of Stage of Maturity on the Nutritive Value of Kochia. *Knipfel, J.E. Kernan, J.A. Coxworth, E.C. Cohen, R.D.H.* Can. J. Anim Sci. 69: 1111-1114 (1989)

Natural Herbicides in Young Canola and Mustard Plants. *Coxworth, E. Foster, K. Austenson, H.* Synergy Magazine, Winter, 1990.

Benefits of Forage Legumes Inclusion in Crop Production and Processing Systems. *Coxworth, E.* Proceedings Conference on Forage Exports and Soil Sustainability, Saskatoon, Saskatchewan, 11 November, 1989.

Treatment of Screenings to Improve the Nutrional Value for Cattle and Destroy Weed Seed Viability. *Kernan, J.A. Knipfel, J.E. Janzen, A.A. Cohen, R.D.H. Mair, A.E.* R-1550-2-E-90

Studies on the Feeding Value of Kochia scorparia L.) Schrad Hay for Beef Cattle. *Cohen, R.D.H. Iwaasa, A.D. Mann, M.E. Coxworth, E. Kernan, J.A.* J.A.Can J. Anim. Sci 69: 735-746 (1989)

FUTURE TECHNOLOGY

Senior Research Scientist: Wayne Craig, Ph.D.

The primary responsibility of Future Technology is to evaluate new markets, technology, products and trends to ensure programs and services are designed to meet current and anticipate future client needs.

Future Technology initiated several projects that examined the role of applied research and development, and technology transfer as a catalyst for the diversification of Saskatchewan's rural economy.

Working with Saskatchewan's horticulture industry, researchers have identified micropropagation as a strategically important technology for the industry. Work is underway to transfer this technology to the industry.

Preliminary investigations were undertaken concerning the development of regional processing centres as a means to diversify the provincial economy.

TECHNOLOGY TRANSFER AND BUSINESS DEVELOPMENT BRANCH

Vice President: Ravi Maithel, M.Sc., P.Eng.

Technology Transfer

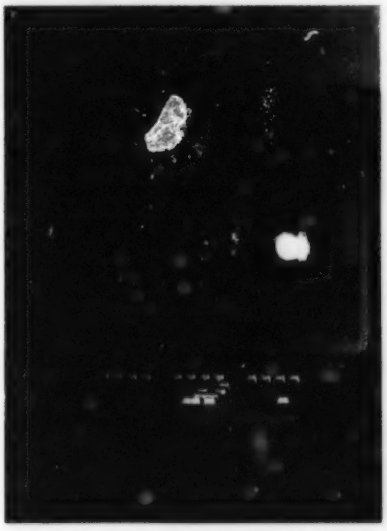
Technology has become a major competitive tool in today's global marketplace. The activities of the Technology Transfer Branch focus on assisting Saskatchewan manufacturers and industry to identify, adapt and transfer appropriate technologies to enhance their competitive position. This process involves both, the inflow of technology, by accessing proven technologies and adapting them to most benefit the province, and the outflow of technology, by commercializing and diffusing technologies developed in Saskatchewan.

Effective technology transfer requires in-depth knowledge and experience across a broad spectrum of disciplines. The Technology Transfer Branch provides clients with the expertise and technical experience required to effectively transfer technologies suited to their need or application. Services provided to clients include engineering, training, project management, and market research.

Business Development

The Branch undertakes activities that support the corporate business development of SRC. In 1989-90 these activities included:

- exploring new technological opportunities
- coordination of business development initiatives with other organizations at the corporate level
- providing hands-on business development assistance to individual programs on "as required" basis.



This state of the art Tektronix CAD Workstation at United Industries Limited in Prince Albert is connected to the Cyber 930 Mainframe housed within SRC's Computer and Integration Services Division.

Staff:
T. Johns
J. Poon (B.Comm)
M.Savostianik
C.Tegenkamp
G.Trainer

COMPUTER AND INTEGRATION SERVICES

Director: Gord Pierce, M.Sc., B.E.

Computer and Integration Services has pioneered the use, education and training in the areas of computer aided engineering (CAE), computer aided design and drawing (CADD), and computer aided manufacturing (CAM) in Saskatchewan since 1980. Through the efforts of this division, many Saskatchewan firms learned about and tried these technologies for the first time. The division has now moved into helping Saskatchewan firms integrate their operations using computers. This service is being offered to small and medium sized manufacturing companies, professional services companies, distribution companies and construction companies. The division works with engineers from other divisions to carry out these projects. Some of these projects were:

Staff:
C. Jahren (B.A.)
C. McKenzie (B.E., M.B.A., P.Eng.)
R. Reich (Arch. Tech.)

Senior consulting engineer Allan Malinoski serves as the retained welding engineer for 10 Saskatchewan metal fabrication companies, an essential component of their certification with the Canadian Welding Bureau.

- Assistance to an on-site fabrication company to become a manufacturing company utilizing the economies presented by assembly line operations (CAD/CAM) and help them move towards integrated manufacturing systems.
- Developed and presented high performance manufacturing awareness sessions to over 250 Saskatchewan participants. High performance manufacturing includes computer integrated manufacturing and continuous improvement of process.
- Design the concept and layout of a swine production facility using CAD/CAM system. The first of the four hog barns, designed to house over 7,000 animals in a disease-free environment, is now in operation.
- Developed and delivered training to teaching staff and students at Bishop James Mahoney High School. The Cyber computer and related CAD/CAM software are now available for student projects as part of SRC's involvement in the Partnerships in Education program.
- Assisting the development of project costing and financial system for SRC.

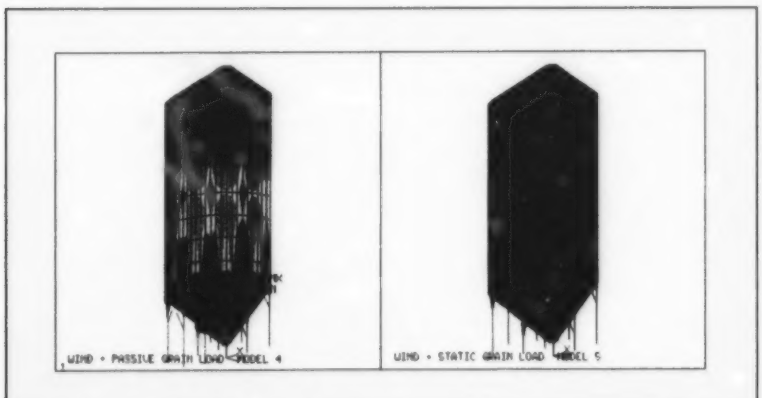
EQUIPMENT AND MACHINERY DEVELOPMENT

Director: David Grier, B.E., P.Eng.

Equipment and Machinery Development offers extensive product development and design services.

Working with developers, manufacturers and inventors, the division provides engineering design, manufacturing engineering, feasibility assessment, engineering analysis, market research and CAD/CAM services for clients designing or redesigning equipment and machinery.

Experienced in all phases of equipment and machinery design, the division's engineers undertake projects in the agricultural, mining and forestry sectors. Division staff developed public seminars in air flow design and practical drive design.



Finite element analyses of a grain storage structure as originally designed (left) and after SRC recommended design changes were made (right). Colour denotes stress level, red being the highest and dark blue the lowest.

Staff:
D. Florizone (C.E.T., Mech.Eng.Tech.)
T. Kaminski (Ph.D.)
A. Malinoski (B.E.)
P. Patenaude (B.Comm.)
A. Udell (C.E.T., CAD/CAM Tech.)

Some projects during the year were:

- Expanded welding engineering services to provide retained welding engineer for ten Saskatchewan steel fabricators.
- Finite element analysis of process equipment in potash mines.
- Developed user specifications and design information for farm equipment by coordinating a focus group with farmers.
- Improved suspension systems for logging trailers.
- Assisted a small Saskatchewan manufacturer meet Ontario Department of Labour standards for new product.

INNOVATION AND PRODUCTIVITY

Director: John Spankie, B.Sc., P.Eng.

Innovation and Productivity offers a range of services to improve the productivity and quality of clients' operations. It also offers services to inventors and other innovators to assist with the management of product development projects. Experienced in Manufacturing Resource Planning (MRP) Distribution Resource Planning (DRP), Quality Assurance and computer systems analysis, the division undertakes projects for manufacturers, entrepreneurs and other organizations.

Some of the projects during the year were:

- A catalogue of business opportunities for rural areas (CORA) was made available to Saskatchewan entrepreneurs via the Rural Service Centres under a contract for Saskatchewan Rural Development.
- Work was conducted to identify provincial manufacturers' technical needs and requirements for the successful introduction of quality control and quality assurance programs.
- Technology searches were conducted for Saskatchewan inventors in association with the Canadian Innovation Centre.

Publications:

Inventory Management - Problems and Solutions. *Hansen, C.* I-4503-2-D-89

Manufacturing Resource Planning and the Effects of Just-in-Time. *Spankie, J.* I-4504-1-D-89

Staff:

C. Hansen (M.B.A., B.Sc.)
L. Smith (B.Comm.)

PRECISION INSTRUMENTS

Manager: Orville Olm

Precision Instruments uses integrated computer aided design/manufacturing systems with a Computer Numerical Control (CNC) Milling Centre. The resulting system provides industry with a sophisticated product development tool that completely integrates the design, development and manufacture of moulds for a range of plastics products and parts.

Precision Instruments operates the Plastics Resource Centre, which specializes in the design of plastics products and the manufacture of precision tooling, such as moulds and other precision production equipment.

Staff:

M. Peters
B. Seymour
G. van Donger

Technologists in the Precision Instruments Group design and manufacture precision mechanical components, such as those used in the Minitube Air Sampling System.

Practical problem solving and development services were provided to companies and entrepreneurs seeking to bring new products to the marketplace or automate production processes.

The manufacture of plastics products and parts continued to be a major focus for Precision Instruments and projects were completed involving: plastics product design, production injection moulds and prototype development.

Projects performed:

- Development and production of a precision, low maintenance metering pump for the Minitube Air Sampling System.
- Design and production of manufacturing machinery, including metal clip manufacturing and automated machinery for the production of decorative plastics flowers.
- Completed 25 plastics product and part designs.
- Produced 14 production injection moulds for plastics manufacturing.
- Developed seven prototype mould systems.

TECHNOLOGY SERVICES

Director: Tony Rawa, B.Sc., P.Eng.

Technology Services delivers services offered under the National Research Council's Industrial Research Assistance Program (IRAP), under a contribution agreement. This national program provides technical information, industrial engineering expertise, and access to foreign technology to small and medium sized firms in Canada.

During 1989-90, IRAP offered assistance to 2,872 small and medium sized Saskatchewan enterprises by identifying technical problems, developing technical solutions and implementing appropriate technical solutions.

The division also presented seminars and workshops on "Computers in Manufacturing" and "The Handling and Labelling of Hazardous Materials in the Workplace" (WHMIS).

Technical Advisory Service

- IRAP-C: Personal and confidential on-site technical advisory service handled 2,539 inquiries to assist Saskatchewan firms to define their technical needs and identify opportunities, obtain appropriate technical information and assistance and solve product and production problems.

Financial Assistance in Technical Solutions

- IRAP-H: 45 projects were approved for Saskatchewan firms to employ a student in the technical solution process.
- IRAP-L: Financial assistance was provided to 87 Saskatchewan firms to obtain laboratory services or to employ a consultant or expert to develop or implement a technical solution.

Staff:
B. Apesland (B.E., P.Eng.)
D. Glossop (L.I.M., P.Eng.)
R. Levesque (B.E., P.Eng.)
F. Popoff (C.I.M.)
J. Sher (B.Sc., P.Eng.)
L. Sopher (B.Ed.)
R. Wong (B.E., P.Eng.)
B. Zuk (B.A., B.E., P.Eng.)

- IRAP-M: 12 Saskatchewan firms were assisted with longer term research and development projects using resources both internal and external to the firm.

Technology Inflow Program (TIP)

- 30 Saskatchewan firms were supported in importing technologies new to Saskatchewan.

Technical Information Services - Patent Office

- Provided 194 in-depth responses to technical inquiries from Saskatchewan business and industry.

ELECTRONICS

Manager: Kim Young, B.Sc. B.Eng.

The Electronics Group provides services for the development and integration of electronic systems and components in manufacturing processes. Industrial measurement, control problem solving and design/calibration of instrumentation equipment were the primary focus of projects carried out by the group.

Work was completed on the design and development of an x-ray diffraction controller and the Minitube Air Sampling System was supplied to the Swedish Defense Department. A study was conducted concerning the application of surface mount technology (SMT) as an important technology for Saskatchewan manufacturers.

Publications:

Automated Thermal Desorption Model ATDU-03 Operator's Manual. *Young, K. Peters, M.* I-4791-1-E-89

Automated Thermal Desorption Unit Model ATDU-04 Operator's Manual. *Young, K. Peters, M.* I-4791-2-E-89

Minitube Air Sampling System Compact Transmitter Operator's Manual. *Young, K.* I-4791-3-E-89

SRC engineers and technologists designed and manufactured the microprocessor based system for the Minitube Air Sampling System which recently received both Canadian and U.S. patents.

Staff:
K. Babich

PRODUCT TESTING LABORATORY

Manager: Dave Jennings

The Product Testing Laboratory responds to the needs of industry for testing and certification of industrial and consumer products. The fully equipped laboratory performs mechanical and physical testing services for Saskatchewan and Canadian industrial clients. Laboratory staff works with clients to develop specialized testing procedures to insure high standards for Saskatchewan and Canadian made products.

All tests meet the criteria and conform to the requirements of national standard agencies. The laboratory also works with provincial and federal agencies to develop and draft industry standards for products.

Staff:
J. Flynn
J. Jones (B.A., Inst.Tech.)
T. Johns
J. Kalthoff (B.A.)

SRC technologist Jack Kalthoff performs a peal adhesion test using the Instron Universal Tensile/Compression Tester.

- Conducted specialized chamber tests to identify and determine rates of volatile emissions from construction materials such as caulks and sealants, insulation materials, paints, coatings, primers and pressure-treated wood products to ensure the products meet health and safety guidelines or standards.
- Provided a variety of testing services to various federal and provincial government agencies, as well as to Canadian building product manufacturers and distributors.
- Designed and fabricated rock mechanics instrumentation, capable of monitoring underground mine stresses and deformations, for use in potash mines.
- Continued triaxial creep testing of potash cores to obtain material property data for potash mines.

SPECIAL PROJECTS

Director: John Bergsteinsson, B.Ed., B.Sc.

The Special Projects group provides support for SRC management at both the executive and operating levels. The primary focus is on creating awareness and assessing the significance of new technologies, business development activities and project startups.

Some projects performed were:

- Contractual work related to advanced industrial materials technology development for Saskatchewan industry.
- Participated in organizing the Procurement Challenge '89.
- Facilitated the introduction of business opportunities associated with the following technology based initiatives:
  - Strategic Opportunities in Automation and Robotics (STEAR)
  - Tactical Command, Control and Communications System (TCCS)
  - The KAON Factory Project
- Prepared report on "Opportunities for Advanced Industrial Materials in Saskatchewan".

Publications:

Saskatchewan Stear Forum. *Bergsteinsson, J.* I-743-1-D-89

Selected Research and Development Activities in Saskatchewan: TCCS Program. *Bergsteinsson, J. Smith, L.* I-743-2-E-90

OPERATIONS BRANCH

Vice President: George MacKay, B.A.

The Operations Branch provides internal support services for the organization. In 1989-90, major emphasis was placed on automation of laboratory services and financial information systems to improve services to internal and external clients. Automation allowed the branch to expand its client base without increasing staff levels. The two service laboratories in the branch, Analytical Services and the Bovine Blood Typing Laboratory, both recorded their best years ever.

- Completed long-term lease agreement with Cameco for Pilot Plant space. Received R&D facility contracts in conjunction with the agreement.
- Enhanced employee safety by installing fume hood flow monitors and tepid water eyewash and shower systems in SRC laboratories.
- Introduced CODOC, a fully automated government publications indexing and cataloguing program in the Information Centre.
- Trained all staff and labelled all hazardous materials in compliance with the federally legislated Workplace Hazardous Materials Information System (WHMIS).
- Developed an Employment Equity Plan for SRC for approval by the Saskatchewan Human Rights Commission.
- Renewed the "Partnerships in Education" agreement with Bishop James Mahoney High School. Installed a CAD (Computer Aided Design) terminal at the school.
- Sponsored a high school student to attend the Shad Valley Program, administered by the Canadian Centre for Creative Technology.

The Branch also provides management direction under a services contract to the Prairie Agricultural Machinery Institute (PAMI).

- Implemented Year Two of PAMI's five-year strategic plan.

Human resources officer Jonathan France facilitates "Frontline Leadership", a course designed to develop and enhance management skills of SRC employees.

Climatologist Elaine Wheaton reviews a publication with graphics designer Hans Piek (right) and SRC communications manager John MacIntosh.

Financial Services Staff:
Controller: R.J. McGrath (M.B.A., C.M.A.)
R. Dick (B.A.)
M. Dymond
B. Hayseth
M. Millhouse

Human Resources Staff:
Manager: J.Sanderson (B.B.A)
J. France (M.A.)
M. Limet

Shops and Facilities Staff:
Manager: Ken Owens (B.A.C.)
I. Coleman
D. Collins
D. Friesen (B.A.)
J. Giesinger
B. Marshall
D. McEwan
G. McLean
M. Nelson
N. Nepper
J. Neufeld
W. Rielkoff
P. Sherwood
J. Wright

Information Services Staff:
Manager: M. Samms (Lib.Tech.)
H. Acton
C. MacLeod
R. Middleton
C. Peters

Communications/Graphics/ Publications Staff:
Manager: J.R. MacIntosh
P. Greenidge
C. Sardinha (Graphics Coordinator)
J. Mamer
B. McIntosh (C.C.)
E. Perkins
H.G. Piek
L. Weegar (Publications Coordinator)

Safety Officer:
G. Meginbir (B.A.)

Research technician Jeff Zimmer uses a Benzene Synthesizer to convert carbon from samples into benzene which is then used in a liquid scintillation counter to determine the residual carbon-14. Carbon-14 dating can determine the age of a sample as far back as 30,000 years.

ANALYTICAL SERVICES LABORATORY

Director: G. Smithson, Ph.D., P.Eng.

Analytical Services operates one of the largest and best equipped laboratories in the country. Services in radiochemistry, chromatographic analysis and general and water chemistry are provided to commercial and government clients from across the country. Environmental monitoring with a commitment to quality assurance is a major portion of the work performed, however, the laboratory is fully equipped to handle virtually all analytical requests.

The radiochemical section is recognized as the premier laboratory of this type in Canada. All uranium and thorium series isotopes are determined routinely, in addition to delayed neutron counting of uranium and a variety of neutron activation procedures. The laboratory has the capability to determine all man-made radioisotopes.

In the chromatography section a wide range of herbicides, pesticides and toxic organic chemicals are routinely determined. These analyses are usually performed on drinking water supplies, agricultural products and environmental samples.

A special section of the laboratory performs Carbon-14 dating of archaeological samples. This state-of-the-art facility uses low background liquid scintillation counting to provide extremely accurate results.

- Installed two COBAS II analyzers to provide fast, accurate analyses for water quality.
- Further automated lab services by adding an Automated Phenol Analyzer and an Auto Cyanide Analyzer.
- An autosampler was installed on a chromatograph for PCB testing, allowing for unattended operation of the machine.
- Automated analysis of bismuth, selenium, arsenic and antimony improved precision and gave a threefold increase in throughput.
- Developed plasma mass spectrometric procedures to determine ultra-trace levels of uranium in environmental and bioassay samples.

Staff:

S. Barnes (Chem.Tech.)
M. Brenner (Chem.Tech.)
D. Chorney (Chem.Tech.)
L. Chrusch (B.Sc.)
L. Didur
V. Evans
R. Fedyk
M. Fahri (B.Sc.)
L. Jensen
I. Kosla
J. Ma (B.Sc.)
L. MacDonald
S. Magon
P. Moser (Chem.Tech.)
G. Shutiak (Chem.Tech.)
B. Stanek (B.Sc.)
S. Woo (Chem.Tech.)
W. Yuen (Ph.D.)
J. Zimmer (Chem.Tech.)

Publications:

Saskatchewan Research Council Analytical Services Price Brochure. *Smithson, G.* S-803-1-G-89

Saskatchewan Research Council Slowpoke II Facility Annual Compliance Report April 1, 1988 to March 31, 1989 for Atomic Energy Control Board, Canada. *Smithson, G. Chorney, D.* S-803-3-E-89

An Evaluation of Quality Control Data Generated in The Saskatchewan Research Council Chemical and Radiochemical Laboratories. *Smithson, G.* S-803-4-E-89

BOVINE BLOOD TYPING LABORATORY

Manager: Gerry Kraay, Ph.D.

The Bovine Blood Typing Laboratory is the parentage testing centre for Canadian cattle breeders and exporters. The Laboratory continued to work with the cattle industry under the direction of Bova-Can Parentage Testing Inc., an advisory board made up of several national breed associations.

In the DNA Laboratory, besides offering DNA testing, research was initiated on a project to develop new DNA probes that will identify specific genes in the animal's chromosome. Identification of these genes could have a significant impact on the future of Canadian cattle breeding. Another research project was commenced, which involves the study of a gene associated with the immune system.

Breed purity is becoming an important issue for the growing game farming industry. The elk testing program saw increased demand for testing services from game farmers.

- Processed 27,067 bovine samples, an increase of 14.6% over the previous year.
- The elk testing program processed 1,184 samples for breed purity.
- A new service was introduced, Karyotyping, which can detect certain chromosome abnormalities in cattle.

Publications:

Microgeographic Variation in Mitochondrial DNA of Meadow Voles (Microtus Pennsylvanicus) in Relation to Population Density. *Plante, Y. Boag, P. White, B.* (1989)

Highly Polymorphic Genetic Markers in Meadow Voles Revealed by a Murine Major Histocompatibility Complex (MHC) Probe. *Plante, Y. Boag, P. White, B. Boonstra, R.* (1990).

SRC Vice President of Operations George MacKay represented the Bovine Blood Typing Lab and PAMI at Canadian Western Agribition.

Research technician Ernie Lennox makes starch cells used in the electrophoresis process.

ADVISORY BOARD

(as of March 31, 1990)

Ken Aylesworth, Gen. Manager, Canadian Charolais Assoc. (Calgary, Alta.)

Henry Begrand, President, Canadian Charolais Assoc. (St. Louis, Sask.)

Glenn Cherry, Registrar, Holstein Assoc. of Canada (Brantford, Ont.)

Dr. David Christensen, Head, Animal & Poultry Science, University of Saskatchewan, (Saskatoon, Sask.)

Vern Davidson, President, Canadian Gelbvieh Association, (Pontelx, Sask.)

Toni Dickie, Director, Holstein Assoc. of Canada (Brantford, Ont.)

Mel Gosling, Chairman,Canadian Limousine Assoc., (Dalmead, Alta.)

Brian Kitchen, Gen. Manager, Canadian Simmental Assoc.(Calgary, Alta.)

Dr. Gerry Kraay, Manager, Bovine Blood Typing Laboratory, (Saskatoon, Sask.)

George MacKay, Vice President, SRC, (Saskatoon, Sask.)

William Small, President, Canadian Simmental Association, (Craven, Sask.)

Dr. Gene Smithson, Director, SRC Analytical Services Laboratory, (Saskatoon, Sask.)

Harvey Tedford, Secretary-Manager Canadian Limousine Association (Calgary, Alta.)

Staff:

S. Dolezsar (B.Sc.)
V. Gerwing (B.Sc.)
K. Grayson
U. Hollmann
K. Lang (B.Sc.)
E. Lennox (C.T.)
B. Mann (C.T.)
M.Pasitschniak-Arts (M.Sc.)
Y. Plante (Ph.D.)
L. Polishchuk
D. Wright (R.T.)

THE SASKATCHEWAN RESEARCH COUNCIL

FINANCIAL STATEMENTS Year Ended March 31, 1990

AUDITOR'S REPORT

To the Members of the Legislative Assembly of Saskatchewan

I have examined the balance sheet of The Saskatchewan Research Council as at March 31, 1990 and the statements of operations and changes in financial position for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Council as at March 31, 1990 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied, after giving retroactive effect to the change in the method of asset valuation for the employees' pension plan as explained in Note 10 to the financial statements, on a basis consistent with that of the preceding year.

Regina, Saskatchewan
May 31, 1990

G. F. Wendel, C.A.,
A/Provincial Auditor

Statement 1

THE SASKATCHEWAN RESEARCH COUNCIL

BALANCE SHEET

as at March 31

ASSETS	1990	1989
Current assets:		
Accounts receivable	$2,577,185	$2,941,245
Prepaid expenses	106,362	95,220
	2,683,547	3,036,465
Deferred charges (Note 3)	422,000	316,869
Fixed assets (Note 4)	3,244,669	3,382,907
	$6,350,216	$6,736,241
LIABILITIES AND PROVINCE'S EQUITY		
Current liabilities:		
Bank indebtedness (Note 5)	$3,849,678	$2,789,094
Accounts payable	538,348	2,169,116
Deferred revenue (Note 6)	614,509	413,791
Vacation and benefits payable	170,663	176,748
Retroactive salaries payable (Note 7)	70,000	90,000
	5,243,198	5,638,749
Non-current liabilities:		
Sick leave benefits payable	345,531	320,797
Deferred revenue (Note 6)	170,314	310,289
	5,759,043	6,269,835
Province's equity:		
Retained earnings (Statement 2)	591,173	466,406
	$6,350,216	$6,736,241

(See accompanying notes to the financial statements)

Statement 2

THE SASKATCHEWAN RESEARCH COUNCIL

STATEMENT OF OPERATIONS

Year Ended March 31

	1990	1989
Revenue:		
Contracts (Note 6)	$ 9,809,241	$ 9,777,901
Grants from Consolidated Fund		
- operating	5,345,000	5,213,600
- Saskatchewan Property Management Corporation	2,859,800	2,165,500
	18,014,041	17,157,001
Expense:		
Salaries and benefits	9,187,805	8,834,785
Supplies and services	4,490,389	4,981,518
Depreciation	1,008,171	1,006,615
Bank interest	343,109	163,203
Saskatchewan Property Management Corporation (Note 9)	2,859,800	2,165,500
	17,889,274	17,151,621
Net income	124,767	5,380
Retained Earnings, beginning of year	466,406	461,026
Retained Earnings, end of year - (Statement 1)	$ 591,173	$ 466,406

(See accompanying notes to the financial statements)

Statement 3

THE SASKATCHEWAN RESEARCH COUNCIL

STATEMENT OF CHANGES IN FINANCIAL POSITION

Year Ended March 31

	1990	1989
Cash provided by (used in):		
Operating Activities:		
Net income	$ 124,767	$ 5,380
Add (deduct) items not affecting cash:		
Depreciation	1,008,171	1,006,615
Amortization of deferred revenue	(413,791)	(809,343)
Loss (gain) on disposal of fixed assets	(12,059)	24,408
(Increase) in deferred charges	(105,131)	(110,246)
Decrease (increase) in sick leave benefits payable	24,733	(6,339)
	626,690	110,475
Net change in non-cash working capital balances related to operations (Note 8)	(829,401)	926,883
Net cash (used in) provided by Operating Activities	(202,711)	1,037,358
Investment Activities:		
Purchase of fixed assets	(944,848)	(1,197,504)
Proceeds from sale of fixed asset	86,975	19,125
Net cash (used in) Investment Activities	(857,873)	(1,178,379)
(Decrease) in cash position	(1,060,584)	(141,021)
Bank indebtedness, beginning of year	(2,789,094)	(2,648,073)
Bank indebtedness, end of year	$(3,849,678)	$(2,789,094)

(See accompanying notes to the financial statements)

NOTES TO THE FINANCIAL STATEMENTS

1. Status of The Saskatchewan Research Council

The Saskatchewan Research Council was established pursuant to Section 3 of the Research Council Act for the purpose of research and investigation in the fields of the physical sciences, pure and applied, as they affect the economy of the Province of Saskatchewan. The Council is a body corporate which receives monies appropriated by the Legislature for these purposes and is also empowered to conduct research under contract for others and to receive financial assistance pursuant to agreements with other similar agencies.

2. Summary of Accounting Policies

a) Revenue Recognition

Grants received for specific purposes are included in revenue to the extent of related expenses incurred during the year. Grant receipts in excess of related expenses are reflected as deferred grant revenue.

Revenue from the majority of contract work is recognized on the percentage-of-completion method which recognizes revenue as a contract progresses. Unbilled revenues are accrued to the year end for these contracts, while pre-billed revenues received are classified as deferred revenue.

b) Fixed Assets

The assets of the Council are initially recorded at cost, including labour, material and overhead for self-constructed assets.

Depreciation is provided over the estimated useful lives of the assets on the following basis:

i) Sum-of-the-years'-digits method	
Buildings	20 years
Leasehold improvements	5 years
Equipment	10 years
ii) Declining balance method	
Automotive	33 1/3%

c) Pension Costs

The Council participates with its employees in a defined benefit pension plan. Pension costs are determined using the projected accrued benefit cost method prorated on service. This cost reflects estimated plan investment yields, salary increases, mortality of members, terminations and the ages at which members will retire. Adjustments arising from plan amendments, experience gains and losses and changes in assumptions are amortized over the estimated average remaining service lives of employees.

d) Accrued Vacation Credits

The costs associated with vacation credits are recognized when the vacation entitlements are earned. The value of credits plus associated employee benefit costs earned to the year end but not taken are reflected as a liability.

e) Sick Leave Benefits

The Council allows unused sick leave credits to accumulate over the term of employment for each employee and pays out 10% of the unused accumulated sick leave based on the wage rate in effect at the time of termination of employment. The costs associated with these sick leave benefits are recognized when benefits are earned and accumulated by employees at a rate of 10% of the unused accumulated value of credits earned.

3. Pension Plan

The Council maintains a defined benefit pension plan which provides retirement benefits for essentially all employees. The plan provides for pensions based on employees' years of service and their highest five years of earnings. Actuarial projections prepared during the year indicate as at March 31:

	1990
Pension fund assets (at market-related value)	$ 14,801,000
Present value of accrued pension benefits	$ 13,570,000

The deferred charge of $422,000 at March 31, 1990 is the three year cumulative difference between the accounting pension expense according to CICA Handbook section 3460 and the actual long-term pension funding required by the actuary.

Year	Pension Funding Greater Than Pension Expense
1987/88	$ 12,000
1988/89	$255,000
1989/90	$155,000
Total	$422,000

4. Fixed Assets

	Cost	Accumulated Depreciation	1990 Net Book Value	1989 Net Book Value
Buildings	$ 710,636	$ 548,185	$ 162,451	$ 220,534
Leasehold Improvements	646,296	615,465	30,831	66,320
Equipment	9,294,090	6,257,393	3,036,697	3,059,518
Automotive	204,620	200,930	3,690	5,535
Land	11,000	-	11,000	31,000
	$10,866,642	$7,621,973	$3,244,669	$3,382,907

5. Bank Indebtedness

The Saskatchewan Research Council is authorized under section 59 of The Financial Administration Act, to establish a line of credit not to exceed $5,100,000. There is an assignment of the accounts receivable as collateral for bank indebtedness.

6. Deferred Revenue

Government of Canada

The Council has deferred revenue of $258,661 from the federal government under an agreement to jointly fund the costs of operating the Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) Centre. The revenue attributable to capital costs is being amortized in the accounts by the sum-of-the-years'-digits method over a 10 year period which corresponds to the depreciation period of the assets purchased under the terms of the agreement. The current portion of the deferred revenue is $88,347 and is classified accordingly on the balance sheet while the amount included in contract revenue in the current year is $107,300 (1989 - $126,248).

7. Retroactive Salaries Payable

This amount represents the 1989 merit salary adjustment approved by the Board.

8. Statement of Changes in Financial Position

The net change in non-cash working capital balances related to operations is comprised of the following:

	1990	1989
Decrease (increase) in accounts receivable	$ 364,060	$ (341,484)
Decrease (increase) in prepaid expenses	(11,142)	134,695
Increase (decrease) in accounts payable	(1,630,768)	1,074,130
Increase in deferred revenue	474,534	250,071
(Decrease) in vacation and benefits	(6,085)	(30,529)
(Decrease) in retroactive salaries	(20,000)	(160,000)
	$(829,401)	$926,883

9. Related Party Transactions

Related parties to the Council are Saskatchewan's Crown controlled departments, agencies and corporations. Transactions with these parties are recorded at normal market prices except as described herein.

During the year, the Council paid $2.9 million to Saskatchewan Property Management Corporation (SPMC) for accommodation charges on buildings. These buildings were provided to the Council by the Saskatchewan Department of Supply and Services at no cost in prior years until April 1, 1987.

10. During the year, the method of valuing the pension fund assets for accounting purposes was changed. Both the old and new method use market related values. However, the new method recognizes fluctuations in the pension fund assets more gradually.

This change was applied retroactively and financial statements of the prior period have been restated.

This change has had the following effect: Salaries and benefits expense increased by $255,000 (1989 - $8,000) the cumulated deferred charge decreased by $255,000 (1989 - $8,000) and retained earnings decreased by $255,000 (1989 - $8,000).

11. The comparative financial statements have been reclassified from statements previously presented to conform to the presentation of the March 31, 1990 financial statements.